Environmental Effectiveness of Environmental Provisions in RTAs: An Empirical Analysis

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Inmaculada Martínez-Zarzoso

Department of Economics, University of Göttingen, Germany
IEI, Universitat Jaume I in Castellón, Spain

UNIVERSITAT JAUME·I

GEORG-AUGUST-UNIVERSITÄT GÖTTINGEN

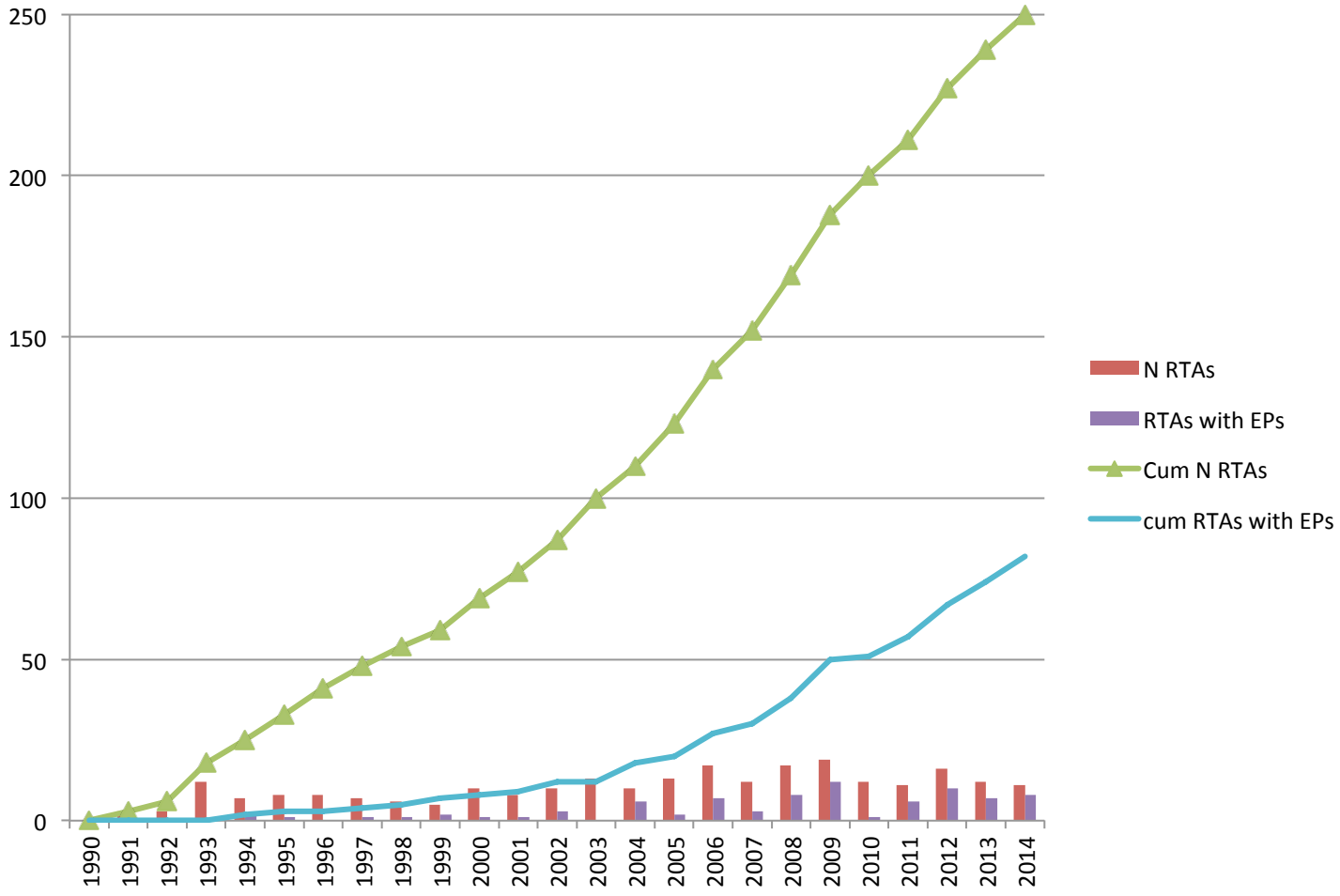
Motivation

- Impact of trade liberalization on environment →**Is trade good or bad?**
- **Environmentalists** → poor open economies with low environment standards may act as pollution havens

- **Free traders** → some sectors could gain protection against foreign competition using environmental protection arguments
- **Regulations**→ inclusion of environmental provisions(EP) in RTAs
  - To promote sustainable development, avoid "race to the bottom"

→?

Number of RTAs by date of entry into force



Why EPs in RTAs?

- Main Hypothesis:
- Environmental provisions mainly proposed by developed countries:
- In order to strengthen stringency of domestic environmental policies of potential RTA members and consequently
- To improve environmental quality in countries with weak institutional frameworks

Examples of EPs

- Issues included in cooperation chapter are very broad :
  - energy conservation, climate change, air quality, trade in environmental goods, water quality and water resources, biodiversity
- Environmental side agreement in RTA **Canada and Chile**:
  - Art 3: "each Party shall ensure that its laws and regulations provide for **high levels** of environmental protection and shall **strive to continue to improve** those laws and regulations",
  - Art 6 refers to he enforcement of environmental regulations and
  - Art. 8 contemplates the creation of the Canada-Chile Commission for Environmental Cooperation in charge of implementing the agreement
- EU agreements generally include a chapter dedicated to sustainable development, e.g. **EU-CARICOM agreement:**
  - Art. 6: "…the parties to an agreement have the autonomy to determine their own levels of domestic environmental protection"

Gallager and Serret (2011) provide extensive examples of the most frequently included environmental provisions

Main aims and methods

- Elaboration of a commitment index (CI_EP) of environmental provisions (depth, breadth) →Revision: Reweighted index (Canada request, included)
- To analyze the impact of **the inclusion of environmental provisions (EPs)** in regional trade agreements on environmental indicators (OECD sample, first results) →Revisions: Extended sample of countries over the period 2000-2011 (PM2.5)/1970-2008 (SO_2, NO_x)/ 1970-2011, CO_2)
- for SO_2, NOx and CO_2, the analysis is done for approximately 175 countries, whereas for PM2.5 it is for 48 countries due to data availability
- Method: panel data and instrumental variables econometric techniques, dyn-GMM

CI_EP elaboration I

- The methodology used to categorise the content of Eps in RTAs builds on preliminary work carried out for the JWPTE in 2014
- The indexing system identifies 9 broad categories of EPs and then lists specific questions related to each category
- A maximum score for each question is allocated, and relative weighting has been developed across the different categories to allow for balanced scoring of different RTAs

CI_EP elaboration II

- Individual types of provisions are also tagged as being “breadth” or “depth” provisions
- The ***breadth*** **dimension** accounts for the mere inclusion of different environmental issues in the text of the agreement (e.g. existing obligations in MEAs)
- The ***depth*** **dimension** accounts for the items that refer to “enforceable actions” or “binding commitments

CI_EP elaboration III

- A list of RTAs with environmental provisions for a time period of January 1970 to June 2014 was obtained from the **RTA Information System of the WTO** (RTA-IS)
- We have obtained the list by selecting "*environment*" as the topic covered. In this way, we identified 62 RTAs with environmental provisions
- This list has been refined and completed using the information from recent JWPTE papers and a key-word-search on the text of the recent agreements
- A narrow definition of environmental provisions has been applied in this analysis with implications on the interpretation of results.

Environmental commitment in RTAs				
Environmental provisions	**Commitment criteria**	**BREADTH OR DEPTH**	**weighting score original**	**Weighting score alternative**
1. General			15.0	11
1.1. Preamble	Does the Preamble refer to environment and/or sustainable development?	B	3.0	1
1.2 Chapter	Is there a specific chapter to environmental or sustainable development issues?	B	6.0	5
1.2 Side agreement	Is there a specific side agreement devoted to environmental or sustainable development issues, or environmental cooperation?	B	6.0	5
2. Exceptions			6.0	6
2.1. GATT/GATS	Does the agreement incorporate the general exceptions for environmental matters of GATT Article XX and/or GATS Article XIV?	B	3	3
2.2. Other	Are environmental issues identified as an exception to one or more specific commitments (e.g. investment, procurement, financial services, SPS measures, technical standards)?	B	3	3
3. Environmental law			15.0	15
3.1. High levels of environmental protection	3.1.1. Is there a provision relating to laws and policies that provide for high levels of environmental protection?	B	1.5	1.5
	3.1.2. Does the provision provide a binding commitment?	*D*	*1.5*	*1.5*
3.2. Non-derogation from environmental law	3.2.1. Does the provision aim that parties do not derogate from their environmental laws in order to encourage trade or investment, or in any other manner affecting trade or investment?	B	1.5	1.5
	3.1.2. Does the provision provide a binding commitment?	*D*	*1.5*	*1.5*
3.3. Improvement of environmental law	3.3.1. Do the parties agree in the provision to strive to improve their levels of environmental protection?	B	1.5	1.5
	3.1.2. Does the provision provide a binding commitment?	*D*	*1.5*	*1.5*
3.4. Effective enforcement of environmental law	3.4.1. Do the Parties agree to effectively enforce their environmental laws,	B	1.5	1.5
	3.1.2. Does the provision provide a binding commitment?	*D*	*1.5*	*1.5*
3.5. Access to remedies	3.5.1. Do the Parties commit to provide effective access to remedies for violations of their environmental laws?	B	1.5	1.5
	3.1.2. Does the provision provide a binding commitment?	*D*	*1.5*	*1.5*

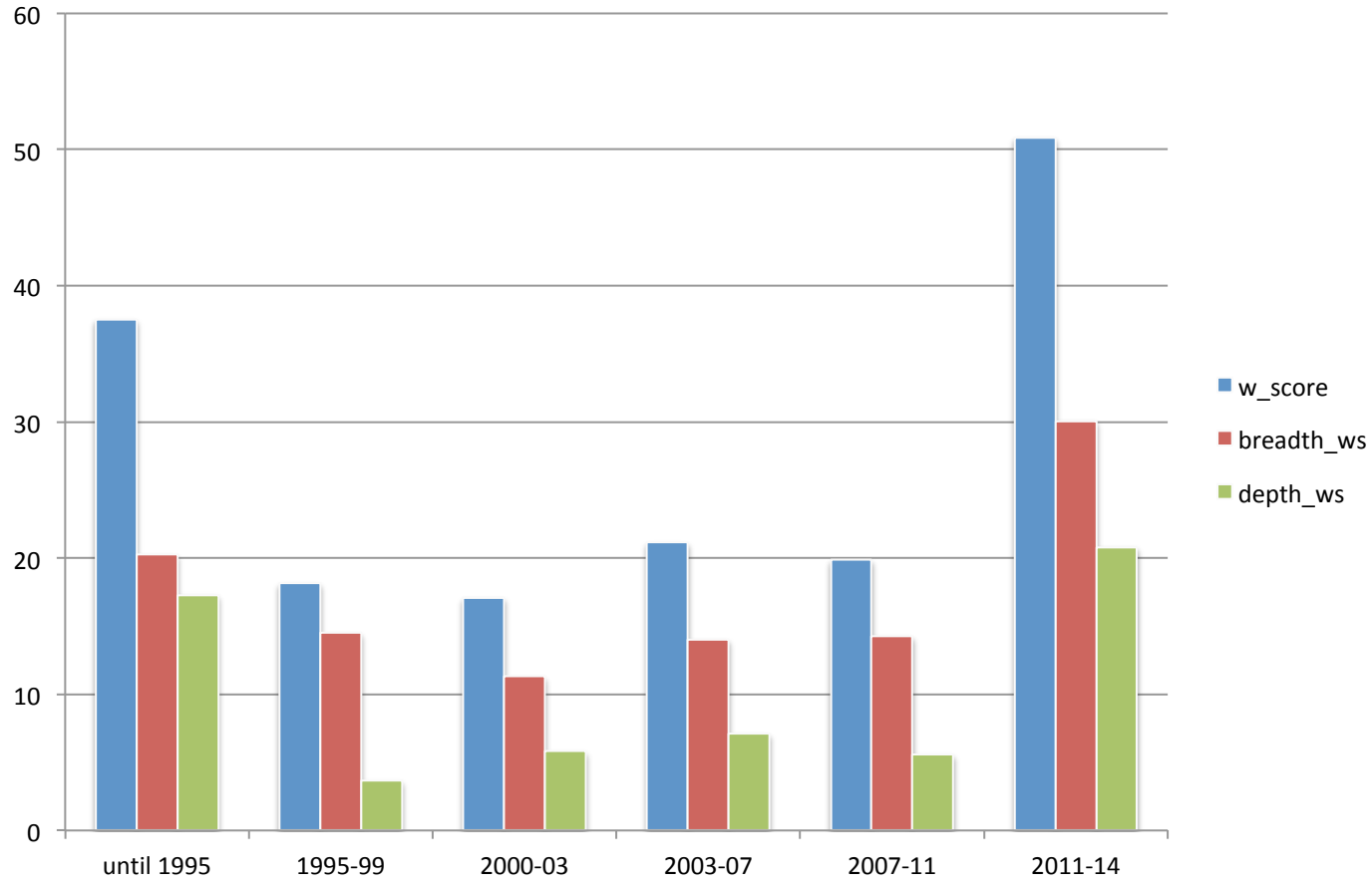
Summary statistics of environmental CI_EP

Variable	mean	median	max	min	standard deviation
ciw_score	17.82	9	62	3	17.11
breadth_ws	13.21	9	38	3	10.19
depth_ws	4.64	0	27	0	7.66

Note: *ciw_score* is the weighted score of the commitment index (sum of breadth and depth components), *breadth_ws* and *depth_ws* denote the weighted sum of the categories that belong to each dimension.

CI_EP results I

Commitment index computed for a total of 115 RTAs with environmental provisions



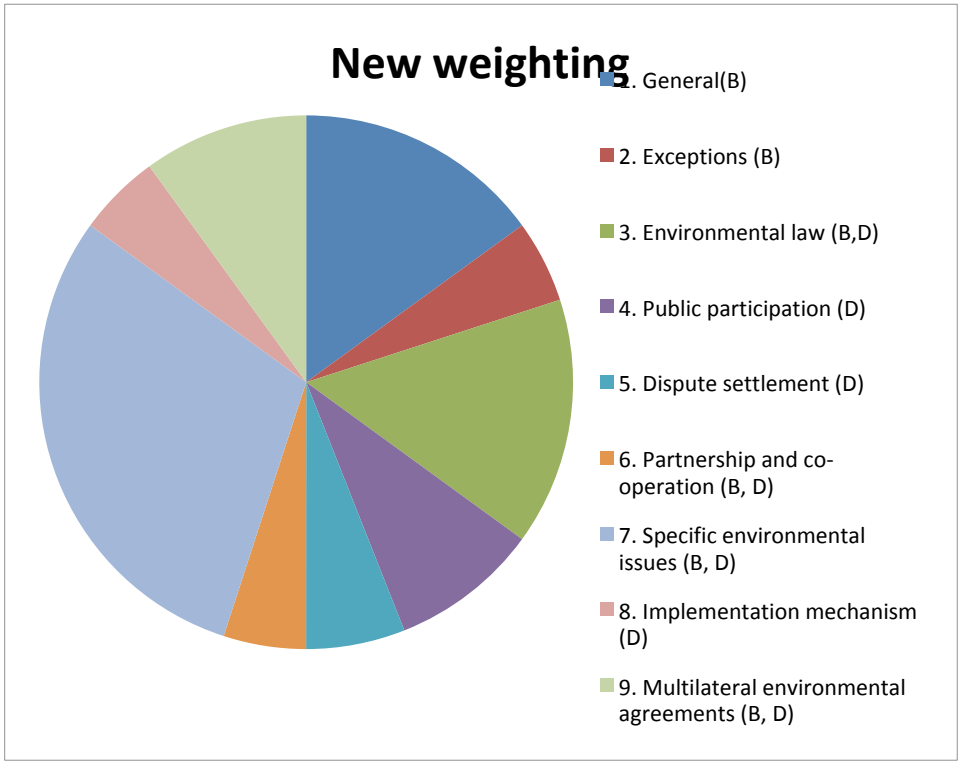
Example: Environmental Law: **3.1. High levels of environmental protection**

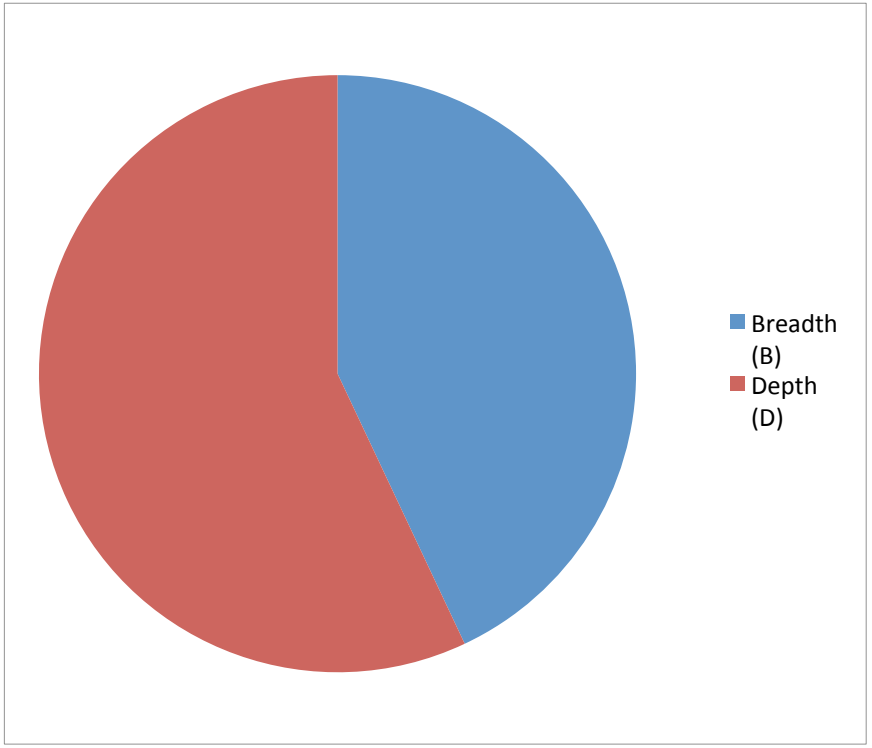
Breadth: 3.1.1. Is there a provision relating to laws and policies that provide for high levels of environmental protection?

Depth: 3.1.2. Does the provision provide a binding commitment?

CIEP results II

Weighting of the different provisions and of the two dimensions (Breadth, Depth)





Weights based on an informed assessment of both their likely relative impact on environment and their rarity amongst the bulk of RTAs . The higher the expected impac of an environmental provision the higher the weight is given to that category

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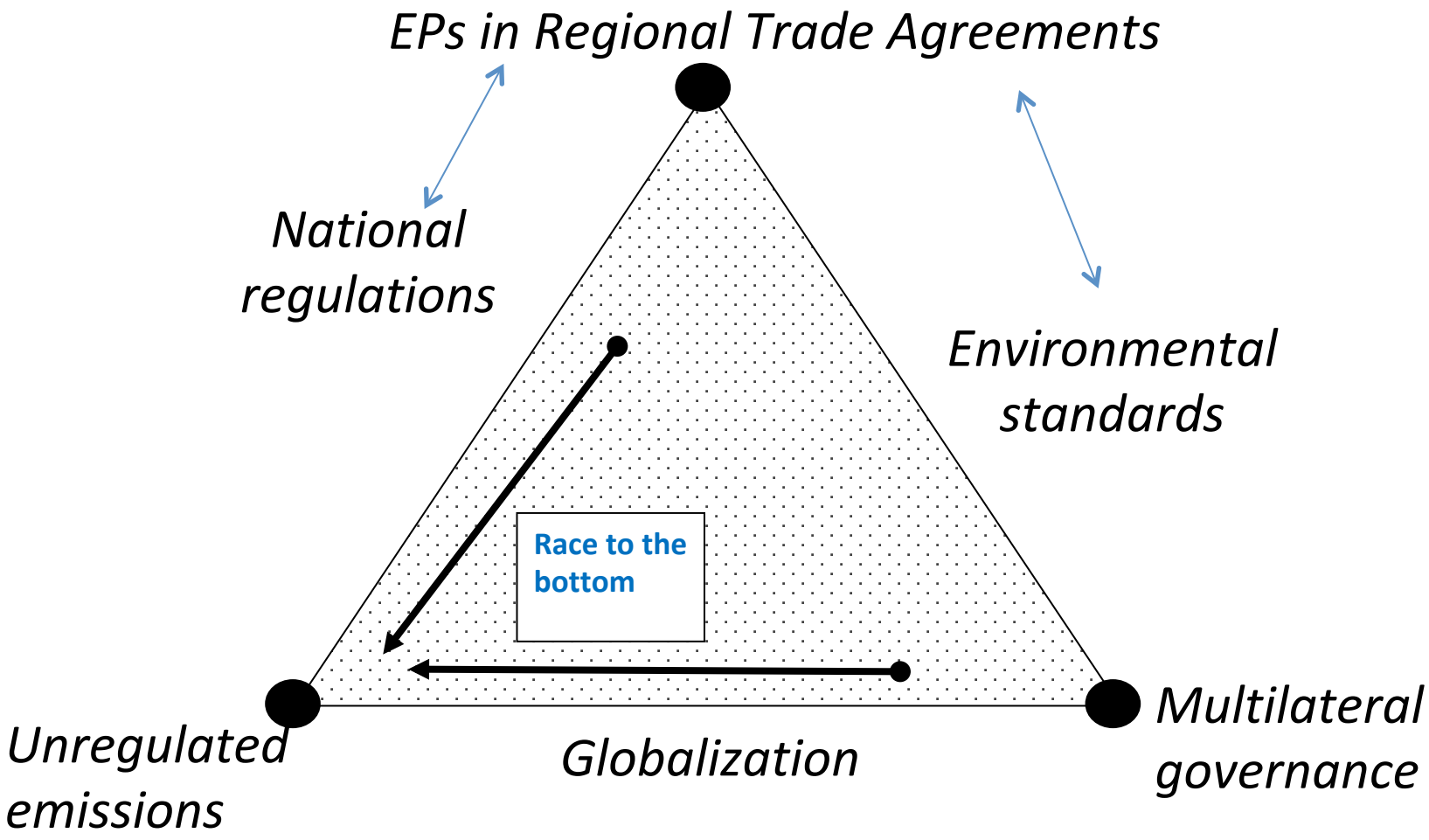
Trade and environment: Effects of trade liberalization

Environmental effects of trade liberalization	Direction	Explanation
Scale effect	Negative	The factors of production all increased by the same amount → increase pollution
Technique effect	Positive	Shift to cleaner techniques. Gains from trade: speeds innovation, higher standards
Composition effect	?	Increase pollution if more resources are devoted to producing the polluting good or lower pollution if an economy specializes more in the cleaner good

Pollution haven, Race to the bottom?→ The role of regulations

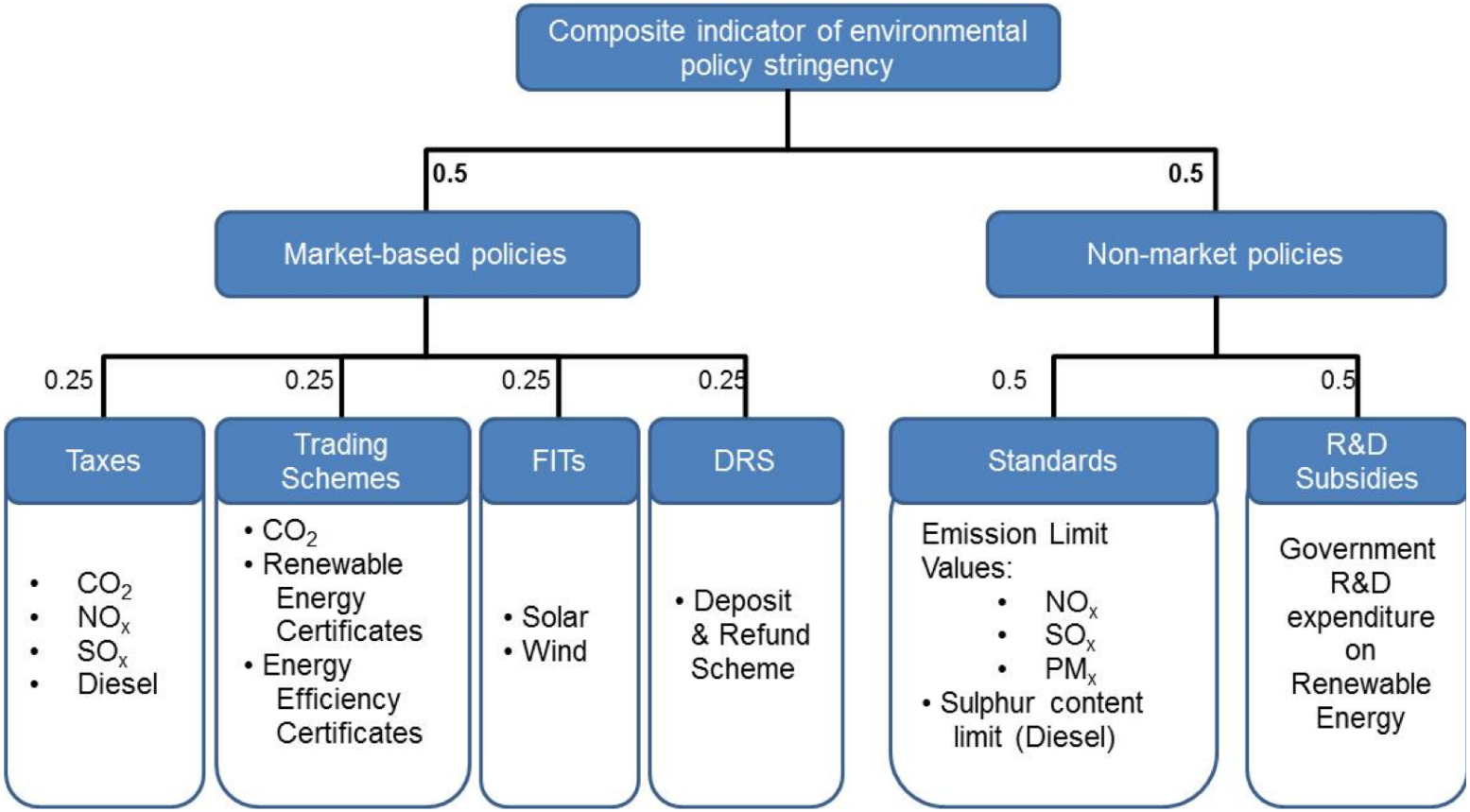
Environmental regulations



Empirical strategy (I)

- A simplified version of the determinants of environmental quality (controlling for Scale, technique and composition effects): **Effect of participation in RTAs** with/without EPs for given levels of:
  - **Population**
  - **Per-capita GDP** (estimated from a growth equation)
  - **Openness** (estimated from a gravity model)
  - **ESI** (Environmental policy stringency index)→not available for the extended sample
- Revision:
- New results with extended samples of countries for 4 pollutants

Figure 2. Economy-Wide Environmental Policy Stringency Indicator



Source: Botta and Kozluk (2014).

Empirical strategy II

- Hypothesis

➡ For a given level of environmental regulations, participating in RTAs with EPs could also help reducing air pollution mainly if:
→ EPs provide enforcement mechanisms and encourage the member countries to effectively apply their national regulations

Model specification

Model (1) :

$$\ln(E_{it}) = \gamma_{0i} + \gamma_1 \ln(Pop_{it}) + \gamma_2 \ln\left(\widehat{GDPcap_{it}}\right) + \gamma_3 \ln\left(\widehat{GDPcap_{it}}\right)^2 + \gamma_4 \ln\left(\widehat{Open_{it}}\right) + \gamma_5 \ln(ESPI_{it}) + + \gamma_6 \sum_j w_{jt} * rtaenv_{ijt} + \gamma_7 \sum_j w_{jt} * rtanenv_{ijt} + \delta_t + \mu_{it}$$

Model (2):

$$\Delta\ln(E_{it}) = \delta_0 + \lambda\Delta\ln(E_{i,t-1}) + \gamma_1 \Delta\ln(Pop_{it}) + \gamma_2 \Delta\ln(\widehat{GDPcap_{it}}) + \gamma_3 \Delta\ln\left(\widehat{GDPcap_{it}}\right)^2 + \gamma_4 \Delta\ln\left(\widehat{Open_{it}}\right) + \gamma_5 \Delta \sum_j w_{jt} * rtaenv_{ijt} + \gamma_6 \Delta \sum_j w_{jt} * rtanenv_{ijt} + \Delta\theta_t + \mu_{it}$$

Results for OECD countries CFE

VARIABLE	PM2.5	SO_2	NOx	CO_2
RTA_with_EPs	-0.00295***	-0.0229**	0.00228	-0.00442***
	[0.00106]	[0.0105]	[0.00461]	[0.000899]
CI_EP weighted_score	-0.0108**	-0.126	-0.0842**	-0.0201***
	[0.00423]	[0.120]	[0.0348]	[0.00388]
CI_EP Breadth_ws	-0.0158**	-0.151	-0.119**	-0.00244
	[0.00623]	[0.287]	[0.0549]	[0.0614]
CI_EP Depth_ws	-0.0342***	-0.894	-0.237**	-0.156***
	[0.0132]	[0.831]	[0.101]	[0.0300]
RTA_No_EPs	0.0016	-0.00848	0.00193	0.0011
	[0.0018]	[0.00634]	[0.00259]	[0.0018]
Ln_openness	0.00203***	-0.0201**	-0.0109	0.000792**
	[0.0005]	[0.00921]	[0.00846]	[0.000340]
Ln_ESI (t-3)	-0.0571***	-0.233	-0.0338**	-0.069***
	[-2.940]	[0.155]	[0.0133]	[0.140]
Nobs	348	456	456	514
Countries	29	29	29	29

Results for extended sample

VARIABLE	PM2.5	SO_2	NOx	CO_2
RTA_with_EPs	**-0.00306*** **	**-0.0217*** **	**-0.0110** **	**-0.00676*** **
	[0.000880]	[0.00709]	[0.00470]	[0.00103]
CI_EP weighted_score	**-0.0105*** **	**-0.249***	-0.117	**-0.0167** **
	[0.00382]	[0.129]	[0.0835]	[0.00726]
CI_EP Breadth_ws	**-0.0154*** **	**-0.338***	-0.155	**-0.0243** **
	[0.00563]	[0.182]	[0.115]	[0.0106]
CI_EP Depth_ws	**-0.0325*** **	**-0.730** **	-0.361	**-0.0515** **
	[0.0119]	[0.352]	[0.245]	[0.0228]
RTA_No_EPs	0.0013	-0.00378	-0.00320	-0.00116
	[0.0013]	[0.00303]	[0.00306]	[0.000845]
Ln_openness	**0.00171*** **	0.0264	0.00523	0.0192
	[0.0004]	[0.0190]	[0.0176]	[0.0117]
N of Countries	48	175	175	175

Are RTAs with EPs good for the environment statistically?

Environmental indicator	Effect of RTAs with EPs
PM2.5 (population weighted mean concentration)	PM2.5 concentrations **decrease** over time by around 0.3 % for 1 additional RTA with EPs and also in RTAs with a higher commitment index
SO_2 per capita	SO_2 **decrease** by around 2 % for 1 additional RTA with EPs And in RTAs with a higher commitment index
NOx per capita	NOx **decrease** by 1 % for 1 additional RTA with EPs
CO_2 per capita	CO2 **decrease** over time around 0.6 % for RTAs with EPs, more for depth EPs

Are RTAs with EPs good for the environment? Sensitivity and robustness

Done recently, added into the report:

- Reweighting of the commitment index→ results are confirmed
- Methods that account for endogeneity (reverse causality, measurement error…) also confirm the results:
  - PDOLS
  - Diff-GMM

Results with CI Reweighted

	(1)	(2)	(3)	(4)
VARIABLES	**PM2.5**	**SO2**	**NOx**	**CO2**
w_score1n	-0.0114***	-0.0658***	-0.0328**	-0.0271***
	[0.00350]	[0.0248]	[0.0157]	[0.00378]
breadth_ws1n	-0.0175***	-0.116***	-0.0574**	-0.0413***
	[0.00528]	[0.0425]	[0.0271]	[0.00611]
depth_ws1n	-0.0293***	-0.149**	-0.0752**	-0.0730***
	[0.00980]	[0.0580]	[0.0368]	[0.00964]
rtanenv	0.00142	-0.00461	-0.00324	-0.000328
	[0.00134]	[0.00313]	[0.00295]	[0.000849]

Results with D-GMM

VARIABLES	(1) PM2.5	(2) SO2	(3) NOx	(4) CO2
rtaenv	-0.00334**	-0.0293***	-0.0107***	-0.00975***
	[0.00133]	[0.00355]	[0.00215]	[0.00146]
rtanenv	-0.00226*	-0.00796***	-0.00648***	-0.000827
	[0.00136]	[0.00201]	[0.00191]	[0.00110]
ln_pop	0.976***	1.044***	0.0806	0.00552
	[0.167]	[0.141]	[0.0849]	[0.0816]
lngdpcap	1.505***	0.693***	0.383***	1.620***
	[0.275]	[0.203]	[0.147]	[0.224]
lngdpcap2	-0.0668***	-0.00737	0.00684	-0.0554***
	[0.0177]	[0.0139]	[0.0101]	[0.0149]
ln_open_predict	0.00144	0.00900	0.00569	-0.00140
	[0.00546]	[0.0128]	[0.0108]	[0.0107]
Observations	618	4,342	4,609	4,803
R-squared	0.422	0.213	0.131	0.369
Number of countries	48	174	175	175

Developed versus developing countries

VARIABLES	(25) PM2.5rich	(26) SO2rich	(27) NOxrich	(28) co2rich	(29) PM2.5poor	(30) SO2poor	(31) NOxpoor	(32) co2poor
diw	**-0.0137**	**-0.00536**	**-0.00697**	**-0.00600**	**-0.0169****	**-0.0215***	**-0.0164****	**-0.0129*****
	[0.0142]	[0.00995]	[0.0120]	[0.00432]	[0.00855]	[0.0112]	[0.00700]	[0.00376]
rtanenv	0.00237*	0.00110	-0.000722	-0.000107	-0.000732	-0.00242***	-0.00180***	-0.000647*
	[0.00128]	[0.00125]	[0.00170]	[0.000478]	[0.000709]	[0.000652]	[0.000642]	[0.000349]
ln_pop	0.264	0.0828	-0.0847	-0.0409	0.799***	-0.0361	-0.125***	-0.0816**
	[0.228]	[0.161]	[0.134]	[0.0693]	[0.169]	[0.0499]	[0.0471]	[0.0322]
lgdppc_pred	2.896	1.123*	0.853*	0.921*	1.238***	0.0584	0.117	0.325***
	[1.785]	[0.618]	[0.460]	[0.481]	[0.372]	[0.125]	[0.139]	[0.0976]
lngdpcap_pre2	-0.143*	-0.0573*	-0.0400*	-0.0422*	-0.0608***	-0.00303	-0.00651	-0.0158***
	[0.0854]	[0.0306]	[0.0221]	[0.0238]	[0.0204]	[0.00718]	[0.00793]	[0.00592]
ln_open_predict	0.00527	-0.0131*	-0.00773	-0.00327	-0.0267*	-0.0390**	-0.0378*	-0.0158*
	[0.00569]	[0.00780]	[0.00632]	[0.00382]	[0.0147]	[0.0185]	[0.0221]	[0.00826]
L.lpwm_pm25	0.573***				0.253**			
	[0.0847]				[0.0993]			
L.lnso2pce		0.949***				0.848***		
		[0.0191]				[0.0215]		
L.lnnoxpce			0.898***				0.858***	
			[0.0284]				[0.0301]	
L.lnco2pce				0.871***				0.853***
				[0.0306]				[0.0205]
Observations	220	555	597	650	258	2,346	2,517	2,754
R-squared	0.781	0.933	0.744	0.853	0.579	0.598	0.456	0.795
Number of id	22	22	22	22	26	103	105	105
Hansen (p)	0.154	0.290	0.0460	0.568	0.108	0.315	0.960	0.132

Robust standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

Is more trade good or bad for the environment?

Environmental effect of trade	Via growth in income	Trade effect alone: For a given level of income
For PM2.5 concentrations pc	EKC after income of about 4000 USD pc (29 countries sample)	More trade slightly increases emissions (OECD sample) (very low magnitude)
For SO_2	EKC after income of about 3100 USD pc, only sign in one model out of 4 (29 countries sample)	More trade decreases emissions (increase of 10%→decrease 0.2 %) 29 countries sample/ ns in extended sample, differ by R/ Poor(-)
For NOx pc	EKC after income of about 56000 USD pc (29 countries sample)	No significant effect, Poor (-)
For CO_2 pc	No EKC, turning point out of sample (29 countries sample)	More trade increases emissions (negligible magnitude, coeff = 0.0007) 29c/ns 176 c, Poor(-)

Concluding remarks

- A **negative effect** of membership in **RTAs with EPs on emissions** of $PM_{2.5}$, SO_2, NOx and CO_2 is found
- Membership in RTAs with **higher values of the commitment index** is associated with **higher environmental quality** in most cases.
- Membership in RTAs without EPs has no significant effect on the environmental indicators considered
- EPs could encourage members to **apply** and **enforce** more stringent environmental regulations →reduce environmental damage

Thanks for your attention

imartin@uni-goettingen.de

Quantifying the effects on CO_2

Average values of CO2 emissions per capita

Year	2012	Measure	Reduct	N countries	effect
US	16.1	Toness per capita	0.60%	10	0.966
CAN	15.27	Toness per capita	0.60%	10	0.9162
CHL	4.43	Toness per capita	0.60%	14	0.37212
NZL	7.6	Toness per capita	0.60%	5	0.228
JNP	9.54	Toness per capita	0.60%	14	0.80136
ESP	5.57	Toness per capita	0.60%	40	1.3368